

# MasteringBiology

School Name University of Hawaii at Manoa, Honolulu, HI  
Course Name Introduction to Biology II  
Course Format Lecture

**Key Results** Students who consistently attempt MasteringBiology homework tend to have significantly higher exam scores than students who skip the homework.

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**Course materials**  
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## About the Course

The University of Hawaii System includes 10 campuses and dozens of educational, training, and research centers across the Hawaiian Islands. As the public system of higher education in Hawaii, the system enrolls more than 52,000 undergraduate students.

Introduction to Biology II is the second course in a two-semester sequence for life science majors. It is a three-credit lecture course, with a separate, concurrent lab. Both the lecture and lab courses use MasteringBiology. Topics covered include the anatomy, physiology, and systematics of plants and animals; behavior; and ecosystems, populations, and communities. This study encompasses only the lecture portion of the course.

## Challenges and Goals

Large course enrollments make it difficult for Lecturer Justin Walguarnery to identify before the first exam students who are struggling or at risk. He believes that students need timely feedback to help identify the concepts they need to work on and resources to help guide them through the learning process. He implemented MasteringBiology to provide his students with immediate feedback and automatic grading *while* they do their homework, so they know where to focus remediation efforts.

## Implementation

In fall 2013, Walguarnery used MasteringBiology for homework, with the goal of helping students review course concepts and prepare for exams. He gave three exams and assigned eight MasteringBiology homework assignments during the semester.

Walguarnery assigned a postlecture MasteringBiology assignment for each chapter covered. Assignments were posted at the end of each week on the topics covered during that week and consisted primarily of activity questions. Assignments were untimed, and students had until the end of the following week to complete them.

## Assessments

40 percent	Final exam
40 percent	Exams (two)
15 percent	MasteringBiology
5 percent	Attendance

## Results and Data

Data for the fall 2013 semester were analyzed, looking primarily at the course performance of students who attempted MasteringBiology homework assignments versus students who skipped one or more assignments (which was considered to be an assignment with a score of zero).

Figure 1 shows that students who skipped two or more out of eight MasteringBiology homework assignments earned statistically significantly lower exam averages than did students who attempted all the homework assignments.

The results of the analysis show the following:

- The average number of MasteringBiology homework assignments skipped was 1.8.
- Thirty-five percent of students attempted all of the MasteringBiology homework assignments and earned an average homework score of 92 percent.
- Forty-four percent of students skipped three or more MasteringBiology homework assignments and earned an average homework score of 47 percent.

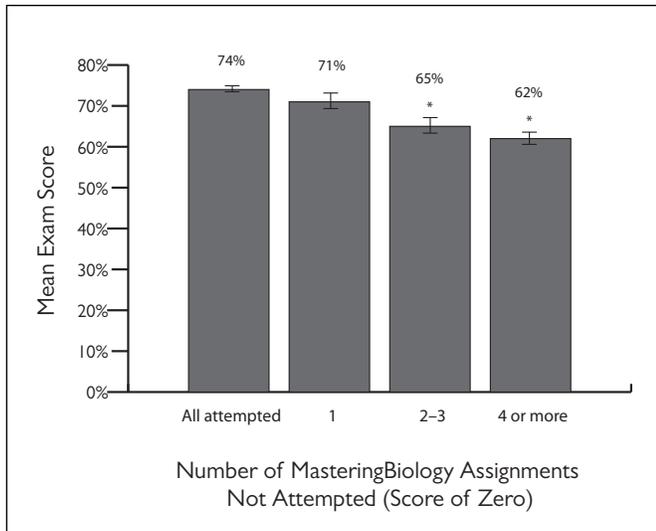


Figure 1. Introduction to Biology II Mean Exam Scores Based on Number of MasteringBiology Homework Assignments Not Attempted. Fall 2013 (All attempted,  $n = 79$ ; 1,  $n = 47$ ; 2-3,  $n = 55$ ; 4 or more,  $n = 43$ . Error Bars = Standard Error. Bars with \* indicate statistically significant difference from All attempted bar.)

To further understand the impact of skipped homework, individual unit exam performance was evaluated using the Exam I score as a baseline. Students were divided into two groups: the Low Exam I Group scored at or below the median (68 percent) for that exam, the High Performing Group scored above the median.

An evaluation of exam trajectories during the rest of the semester was done based on the number of MasteringBiology homeworks (HW) attempted after Exam I (a total of six for Exams 2 and 3), thereby dividing each group (Low and High Exam I) into a Low HW group (less than four attempted) or High HW group (four to six attempted). The following three key findings were observed (Figure 2):

- The Low Exam I groups (Low and High HW) are statistically equivalent on Exam I (as well as on HW prior to Exam I, not shown here). However, by Exam 3, the Low Exam/High HW group is statistically significantly higher than the Low Exam/Low HW group.
- The High Exam I/High HW group is statistically significantly higher than the High Exam I/Low HW group at baseline and at Exams 2 and 3, and this gap increases.
- By Exam 2, the High Exam I/Low HW group and Low Exam I/High HW groups are statistically equivalent.

The findings indicate a trend toward higher exam averages for students who put the effort into MasteringBiology homework despite initial performance on Exam I.

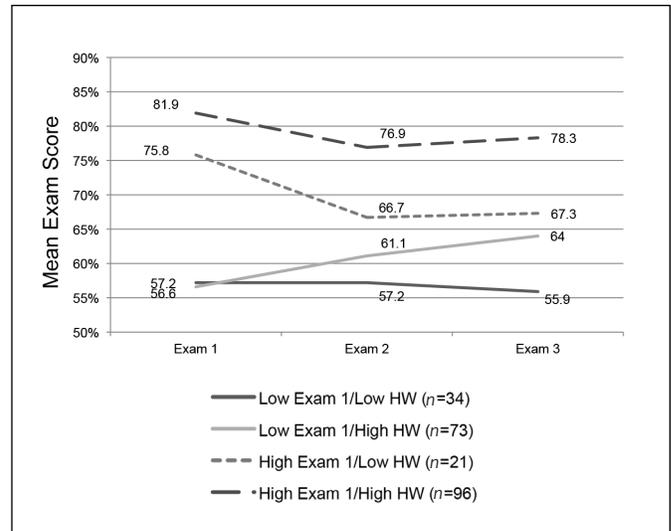


Figure 2. Exam Performance Based on Exam I Scores as the Baseline and Number of MasteringBiology Homework Assignments Attempted

## The Student Experience

Student feedback on MasteringBiology has been positive.

Comments include:

- “I liked the MasteringBiology homework assignments. They helped me prepare for the exams.”
- “I liked how [Walguarnery] made use of MasteringBiology for homework. It was a good and different way to do homework, compared to other courses.”
- “I liked MasteringBiology best.”
- “The online homework was easy, and helped with the understanding of the lesson.”

## Conclusion

Large class sizes can make it difficult to identify students who are struggling, to understand what concepts they are struggling with, and to provide remediation in a timely manner. While motivation can impact student performance, having resources available for students to learn at their own pace and on their own time can be critical to the learning process.

Exam data show that students who put the effort into doing MasteringBiology homework tend to have significantly higher exam scores than do students who skip MasteringBiology assignments, and that the number of homework attempts may be a better indicator of success than Exam I performance.